



Camera Mouse 2012

User Manual

Version 2.3

June 1, 2012

INTRODUCTION AND WELCOME

Welcome to the Camera Mouse 2012 user manual!

Camera Mouse is a program that allows you to control the mouse pointer on a Windows computer just by moving your head.

Camera Mouse uses a standard webcam to track your head. If you move your head to the left, the mouse pointer moves to the left, and so on. Clicking can be done by “dwell time”. If you hold the mouse pointer within a certain area of the screen for, say, a second a mouse click will be issued by the program.

The purpose of Camera Mouse is to help people with physical disabilities to access the computer. In particular, Camera Mouse has proved very helpful to people who have no voluntary movement below the neck, people who can voluntarily control only their head. People with Cerebral Palsy, traumatic brain injury, ALS, Multiple Sclerosis, and various other disorders have used Camera Mouse to access the computer and internet.

Camera Mouse has been put to many other uses as well.

Camera Mouse is software that is designed to work with your Windows 7 or Windows Vista or Windows XP computer and your built-in webcam or USB webcam. Camera Mouse is completely free and may be distributed freely.

Copies of Camera Mouse, copies of this manual, information about programs that work well with Camera Mouse, and answers to Frequently Asked Questions can be found at www.cameramouse.org.

A LITTLE HISTORY

Camera Mouse was invented by Prof. James Gips (Boston College) and Prof. Margrit Betke (then at Boston College, now at Boston University). The original version of Camera Mouse was made available to some families of children with disabilities and some schools and facilities on an experimental basis.

The Camera Mouse technology then was licensed by Boston College to Camera Mouse, Inc., a start-up company out of the IC2 Institute at the University of Texas, Austin. Camera Mouse, Inc. developed a commercial version and made it available on their website at www.cameramouse.com and through other channels. With the demise of the company the license was revoked by Boston College in April 2007 and all the rights to use the intellectual property given in the license were returned to Boston College.

People continued to inquire about Camera Mouse but no version was available. We decided to develop Camera Mouse 2007 and make it available for free on the web. Camera Mouse 2007 worked well but only with a small group of webcams. Camera Mouse 2008 was the same as Camera Mouse 2007 but worked with a much wider variety of webcams. We have continued to

make improvements in Camera Mouse each year. We have added new features and tracked down and corrected problems and kept up with changes in Windows. We usually bring out a new version about every two months. Camera Mouse 2012 is designed to work with Windows 7 as well as Windows Vista and Windows XP and with the 64 bit versions of the operating systems as well as with the 32 bit versions.

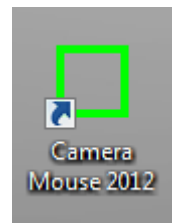
It is very difficult to test Camera Mouse with all the combinations of computer hardware, Windows operating systems, and cameras. If you have problems please notify me at gips@bc.edu.

HARDWARE

To run Camera Mouse 2012 you will need a computer with Windows 7 or Windows Vista or Windows XP and a webcam. We use a Logitech HD Pro Webcam C910 or a Microsoft LifeCam Studio for development. Just about any good quality webcam should do, including most built-in webcams. Very inexpensive webcams can produce noisier images, which Camera Mouse can have a difficult time tracking.

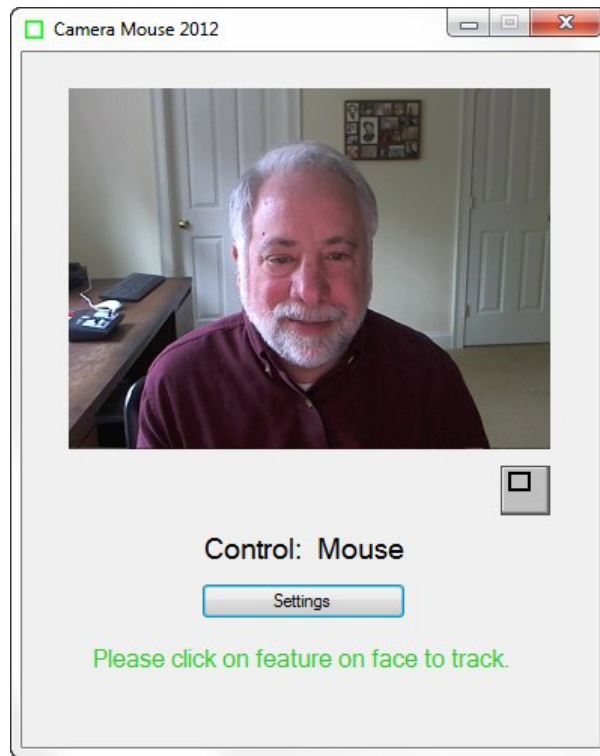
BEFORE USING CAMERA MOUSE 2012

Before using Camera Mouse 2012 you should install the webcam according to the instructions from the manufacturer. Be sure to install the driver software for the webcam that comes with the webcam on CD or the latest driver that is downloaded from the manufacturer's website. *Do not try to use a generic Windows camera driver.* If you can, test to make sure the webcam works before using Camera Mouse.

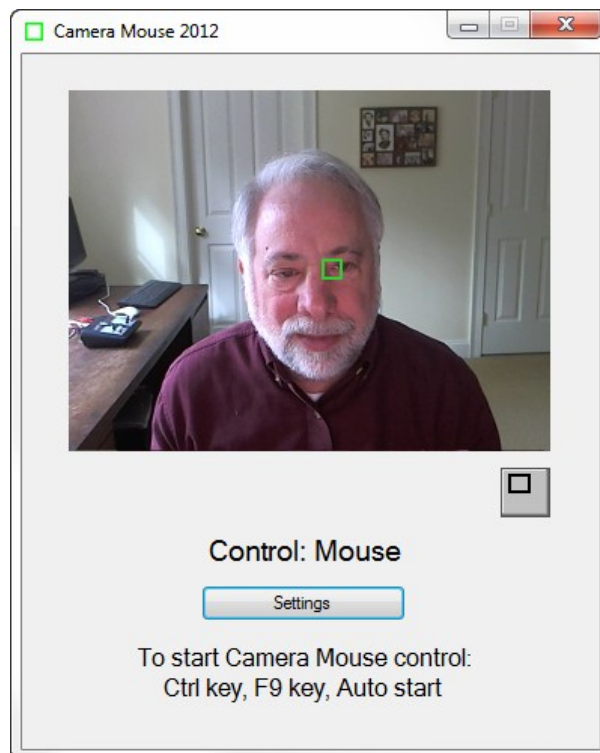


GETTING STARTED WITH CAMERA MOUSE 2012

Place the webcam above or below your monitor so it is pointing at you. Start up Camera Mouse 2012 by double-clicking on the shortcut icon on your desktop. You should see a window with a video screen that contains your face, like looking at yourself in the mirror.



Use the mouse to click on a unique feature of your face. We usually use the inside corner of an eyebrow or eye or the ridge below the nose. A green square should appear where you clicked. Move your head around very slowly at first. The green square should track the feature. If by chance it loses the feature, then move the mouse and select a different feature by clicking on it.



Once the feature on your face is being tracked by the computer, just press the Ctrl key or function key F9 or wait 4 seconds (“Auto start”). Now the tracking of your head should control the mouse pointer. As you move your head slowly to the right, the mouse pointer should move to the right. To return back to mouse control you can move the mouse or press the F9 key or the Ctrl key again.

You can tell whether the mouse or the Camera Mouse is in control by looking below your picture in the Camera Mouse 2012 window.

Select a target on the screen, perhaps an icon or a feature of the background picture. See if you can move the mouse pointer to the target just by moving your head. If you have difficulty reaching a portion of the screen, physically move the mouse to take back control, click on the Settings button to open up the Camera Mouse 2012 Settings window, and change the Gain settings as described below. Practice moving the mouse pointer around the screen with your head until it comes easy.

If you haven’t already, you should download the Aliens and Paint program from the cameramouse.org Downloads page. Also the Staggered Speech onscreen keyboard program from staggeredspeech.org and the Midas Touch program from midastouch.org.

In Camera Mouse, click on a point on your face so it’s tracking. Now open up the Aliens program. Try to keep your head steady so Camera Mouse continues to track. Press the Ctrl key or the F9 key or wait 4 seconds. Move your head slowly. The red crosshairs should move with your head. Now still with your head steady press the space bar. The first alien should appear. Move your head so the crosshair is on top of the alien. You should hear and see an explosion as the alien blows up. It’s just contact with the center of the crosshair. No need for clicking with Aliens or Paint.

Close Aliens when you are finished. (But take a look at the manual or menus. You can substitute any photo for the Alien.)

With Camera Mouse tracking your head, open up Paint. Same drill. Press the spacebar and you are painting by moving your head. You can change the colors and shapes in the menus. Press the spacebar to stop at any time. You can print the picture you have created with a dedication.

Slow, deliberate movements with Camera Mouse are better than fast, jerky movements.

RECENTERING

Each time you start up Camera Mouse or switch control to Camera Mouse, the mouse pointer (usually) re-centers. (This can be changed in the Settings window; see below.) So during a session a good way to center the mouse pointer in the screen is to press the Ctrl key or F9 key twice in a row.

CHANGING THE FEATURE ON THE FACE THAT IS TRACKED

At any time you can go into the main Camera Mouse window and use the mouse to click on a new feature on the face to track. If you selected the tip of the nose and the green square is slipping, try the inside corner of the eyebrow or the ridge between the nose and mouth.

MINIMIZING THE CAMERA MOUSE 2012 WINDOW

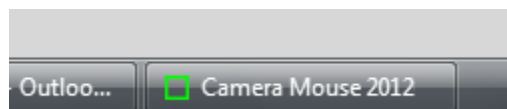
You can minimize the Camera Mouse 2012 window by pressing the Minimize button at the top right of the window (the left of the three buttons).



If the Camera Mouse window is minimized, the window will not appear but the Camera Mouse program will continue to run in the background and to track. You can continue to use Camera Mouse to control the mouse pointer while the window is minimized. The Ctrl key and the F9 key and the mouse still will switch control back and forth to Camera Mouse even though the program is minimized.

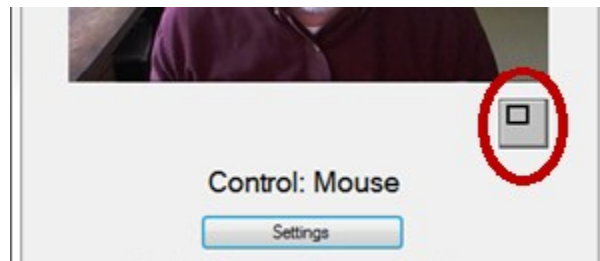
Minimizing the window can be a big help if a child is mesmerized by his or her appearance in the video window or if the Camera Mouse program is distracting the user from the application program.

To bring the Camera Mouse window back from being minimized just click on the Camera Mouse tab that should appear with the other active programs at the very bottom of the Windows screen.



DISPLAYING THE IMAGE IN A SMALLER WINDOW

By clicking on the button under the video image in the standard Camera Mouse window



you can have the video displayed in a smaller window.

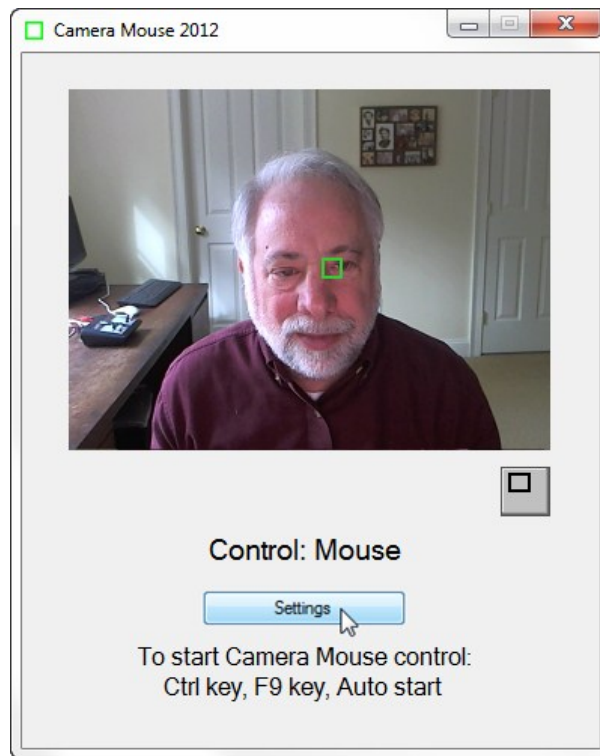


This window will always stay on top of any application on the desktop. This is useful, for example, if you are monitoring the Camera Mouse program while someone else uses it. You can drag the window down to say the bottom right of the screen and look at it now and then to see if the tracking slips. You can still take control with the mouse and click on the smaller video window to reset the tracking. To return the Camera Mouse window to its normal size click on the button below the video image.

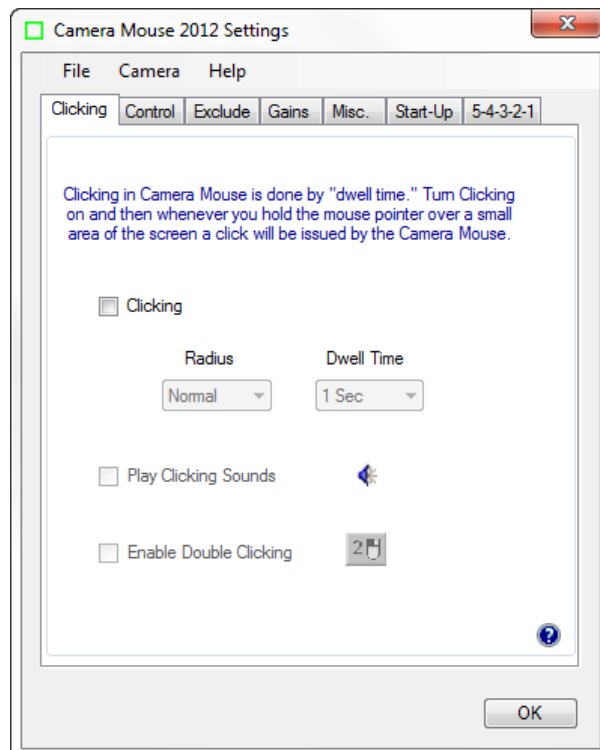


CAMERA MOUSE SETTINGS

Pressing the Settings button in the main Camera Mouse window



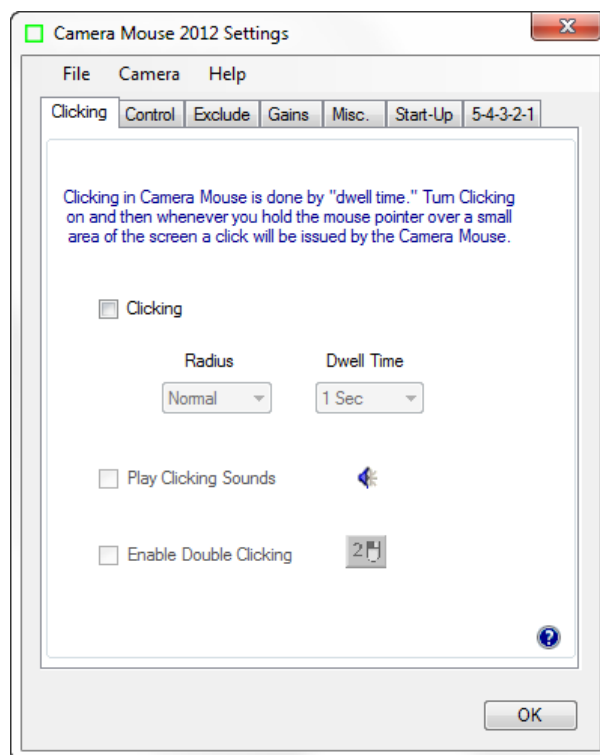
brings up the Settings window



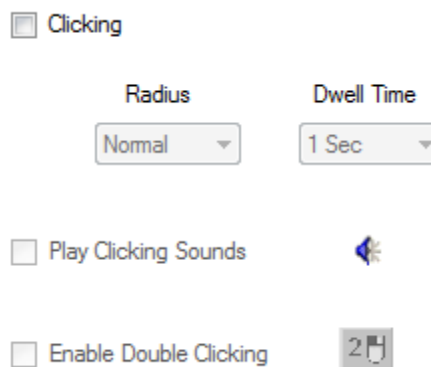
Settings uses a tab based interface with three pull-down menus (File, Camera, Help). Let's go through the various Camera Mouse Settings tabs, starting at the left.

The question mark icon at the bottom right brings up the interactive Help feature for the current tab.

Clicking tab

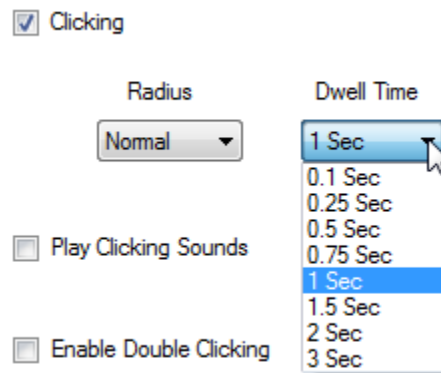


On start up, Clicking generally is off in Camera Mouse 2012.



Clicking in Camera Mouse is done using “Dwell Time”. That means that if you hold the mouse pointer on the screen within a certain small area for a certain period of time then a mouse click will be issued.

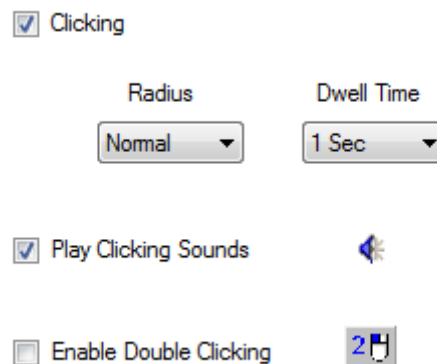
If you turn on Clicking then you can change the Radius of the area and the amount of time during which the mouse pointer must be held in the area (the “Dwell Time”).



A Dwell Time of 0.1 second allows for relatively rapid clicks, as might be useful in a video game.

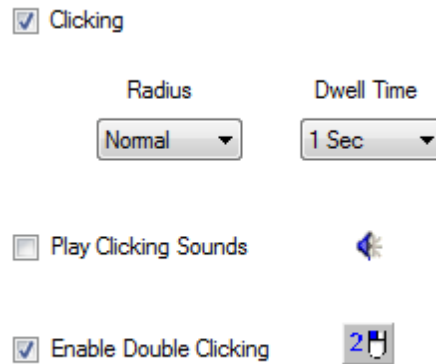
CLICKING SOUNDS

You can have the program alert you with a clicking sound whenever it issues a click by checking Play Clicking Sounds. You can listen to the sound the program would make when a click is issued by clicking on the blue sound icon. 

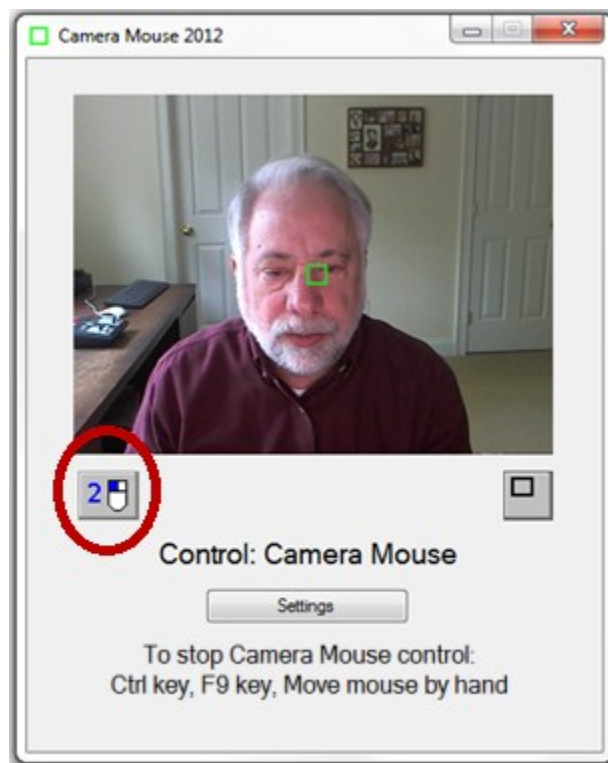


DOUBLE-CLICKING

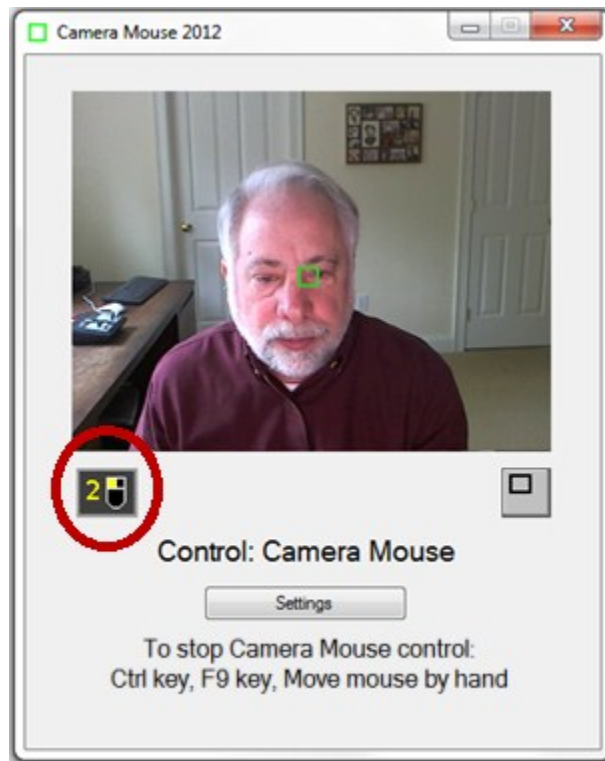
Once Clicking is turned on it's possible to Enable Double-Clicking.



As soon as Enable Double-Clicking is checked a new button appears in the main Camera Mouse window.



If the user clicks on the new “2-click” button then the very next click will be a double-click. So if the user wants to open Paint by double clicking on the Paint icon, the user would first click on the 2-click button. At this point the colors of the 2-click button would be inverted to indicate it is active.

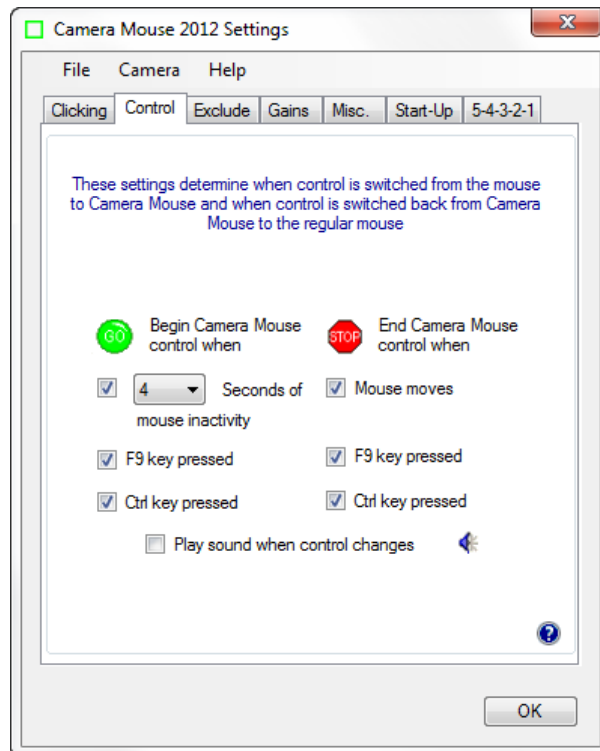


Then the user would use Camera Mouse to move the mouse pointer directly so it dwells over the Paint icon on the desktop, Camera Mouse would double-click (instead of single-clicking), and the Paint program would be opened.

Clicking on the 2-click button tells Camera Mouse that the very next click should be a double-click.

Control tab

The Control tab determines how we can switch from mouse control to Camera Mouse control and back from Camera Mouse control to mouse control.



If the mouse has control there are three possible ways to begin Camera Mouse control of the mouse pointer: you can leave the mouse untouched for a couple of seconds, you can press the F9 key, or you can press the Ctrl key. Which of these methods will work is determined in the “Begin Camera Mouse control when” setting with the green Go. 

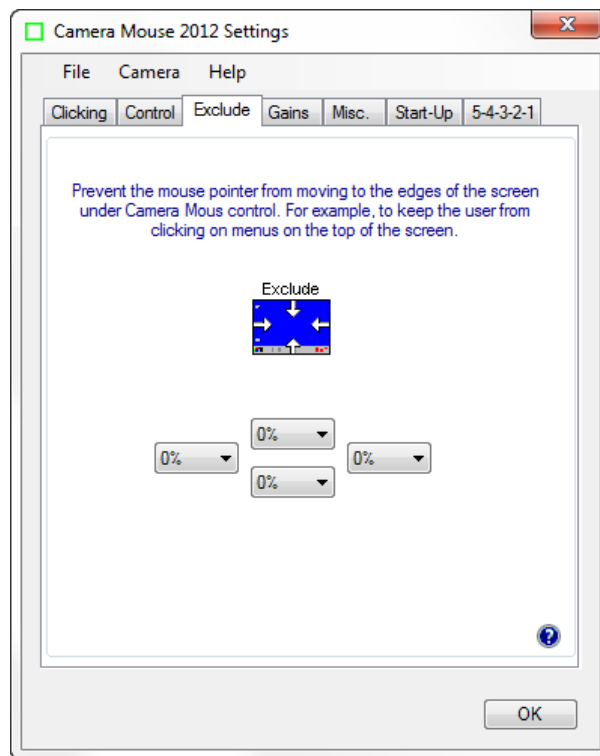
If one or the other key does have meaning in the application program you are running, you can click off its use for Camera Mouse.

Similarly, if Camera Mouse has control, there are three possible ways of switching back to mouse control. The easiest way is to just physically move the mouse. Or you can press the F9 key or the Ctrl key. Which of the three ways is enabled is determined by which boxes are checked under “End Camera Mouse control when” and the red Stop. 

If you’d like, you can have Camera Mouse play a brief sound to alert you when control switches. Just click a check in the box next to “Play sound when control changes”. You can hear the sound that would be played by clicking on the blue sound icon. 

Exclude tab

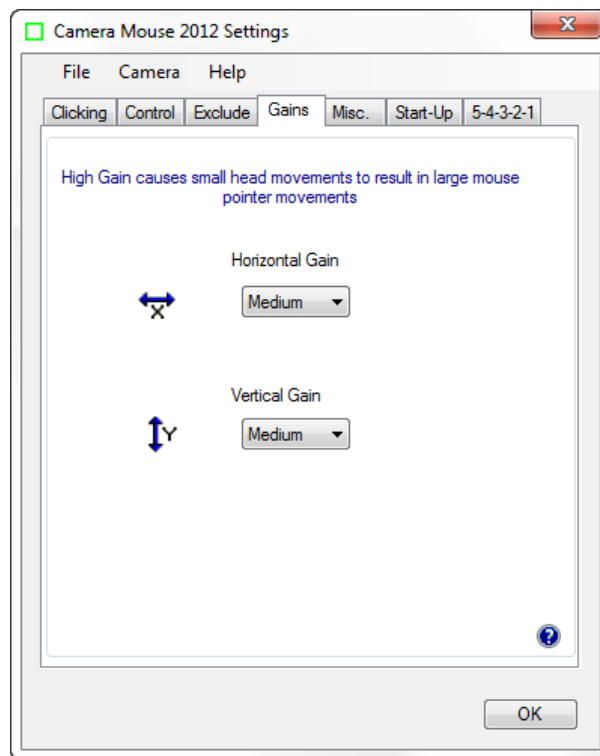
The Exclude feature prevents the mouse pointer from moving to the edge of the screen.



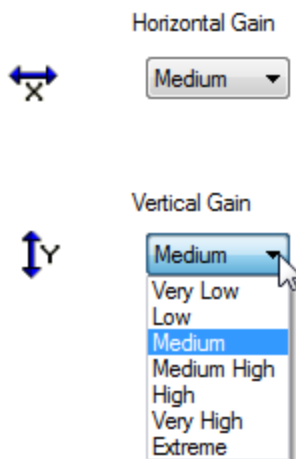
The Exclude feature is included at the request of caregivers who like to run Camera Mouse but don't want the people using the computer to be able to, for example, click on menus at the top of the screen or on other programs at the bottom of the screen or outside of the current window to the right or left. For example, setting the Top Exclude amount to 10% would prevent the user from moving the mouse pointer to the top 10% of the screen.

Gains tab

The Gains determine how your head movements are translated into the mouse pointer movements.



If the Horizontal Gain is Low, then horizontal movements of your head result in relatively short horizontal movements of the mouse pointer. If the Horizontal Gain is Very High, then horizontal movements of your head result in relatively long horizontal movements of the mouse pointer. The same for the Vertical Gain. There are seven possible Gain settings.

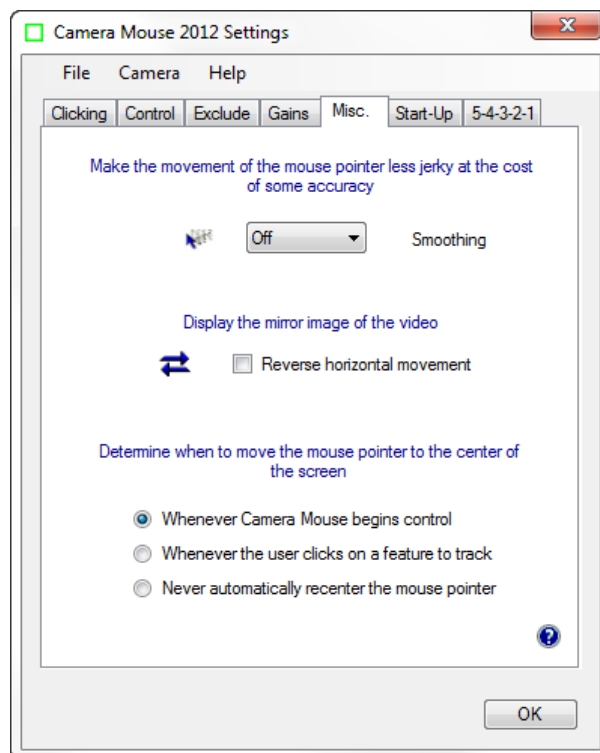


Often people have a more difficult time moving the head vertically than horizontally. It is not unusual to set the Vertical Gain higher than the Horizontal Gain.

An alternative to setting the Gains is to go into the Camera pull-down menu and select Camera Settings. The Camera Settings have been provided by the camera manufacturer. Within the Camera Settings there often is place to Zoom in or out. Zooming in effect increases the Gains.

Misc. tab

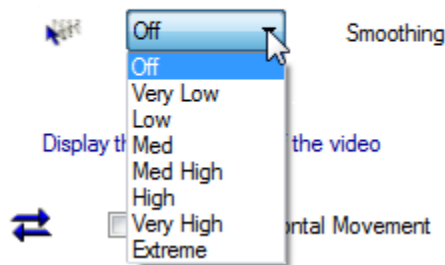
The Misc. tab contains controls for Smoothing, Mirror Image, and Centering.



SMOOTHING

Smoothing allows you to smooth out the jerkiness of the mouse pointer movements. There are eight possible settings:

Make the movement of the mouse pointer less jerky at the cost of some accuracy

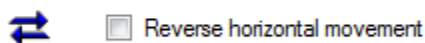


REVERSE HORIZONTAL MOVEMENT

We think the most natural way to use Camera Mouse is for the video window to look like a mirror. So that when you move your head to the right, the image of your head seems to follow you to the right.

Some people prefer it reversed so that when you move your head to the right the head in the image moves to the screen's right which is to your left. The Reverse Horizontal Movement checkbox allows you to reverse the horizontal movement.

Display the mirror image of the video



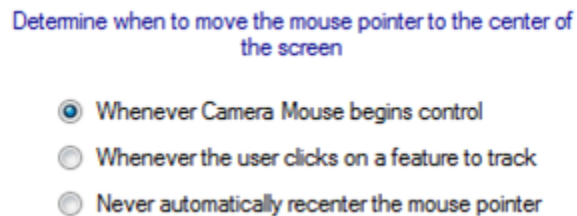
Note that this may be complicated by the Camera Settings. Most cameras have their own Settings window. You can access this window by selecting Camera Settings in the Camera pull-down menu. There you'll probably find a Mirror Horizontal setting or something similar. We suggest you keep this camera setting off. It can get unnecessarily confusing.

CENTERING THE MOUSE POINTER

You may not notice at first, but Camera Mouse automatically re-centers the mouse pointer in the middle of the screen each time Camera Mouse begins control.

Thus if Camera Mouse has control and you press the Ctrl key twice then control will switch over to the mouse and then back to Camera Mouse and the mouse pointer will be placed in the center of the screen.

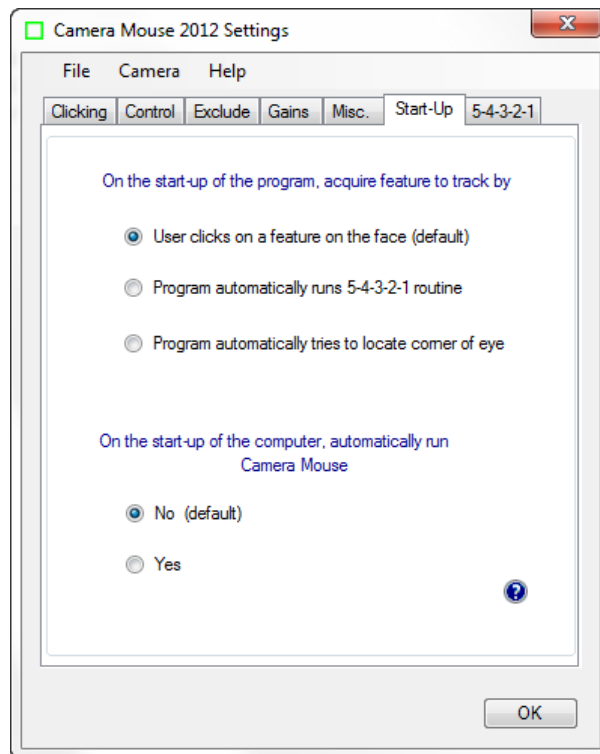
Some Camera Mouse users emailed to request that we provide other options for when Camera Mouse should place the mouse pointer in the center of the screen.



The two other choices are to re-center the mouse pointer whenever a new feature on the face is selected and to never have Camera Mouse re-center the mouse pointer.

Start-Up tab

The Start-Up tab allows you to change how the feature to track is acquired when Camera Mouse is started and also allows you to determine whether or not Camera Mouse is run automatically when your computer is started.



ACQUIRING FEATURE TO TRACK AT PROGRAM START-UP

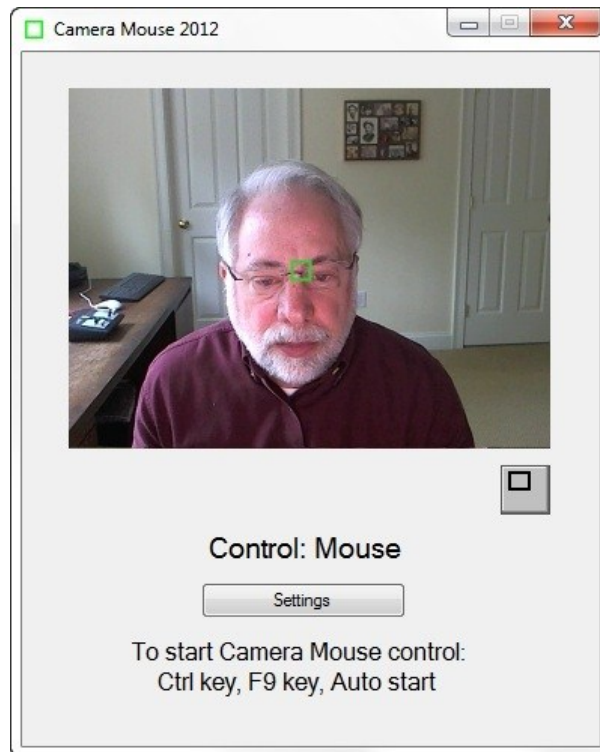
There are three possible ways that Camera Mouse can acquire the point to track when the program begins.

On the start-up of the program, acquire feature to track by

- ☒ User clicks on a feature on the face (default)
- ☐ Program automatically runs 5-4-3-2-1 routine
- ☐ Program automatically tries to locate corner of eye

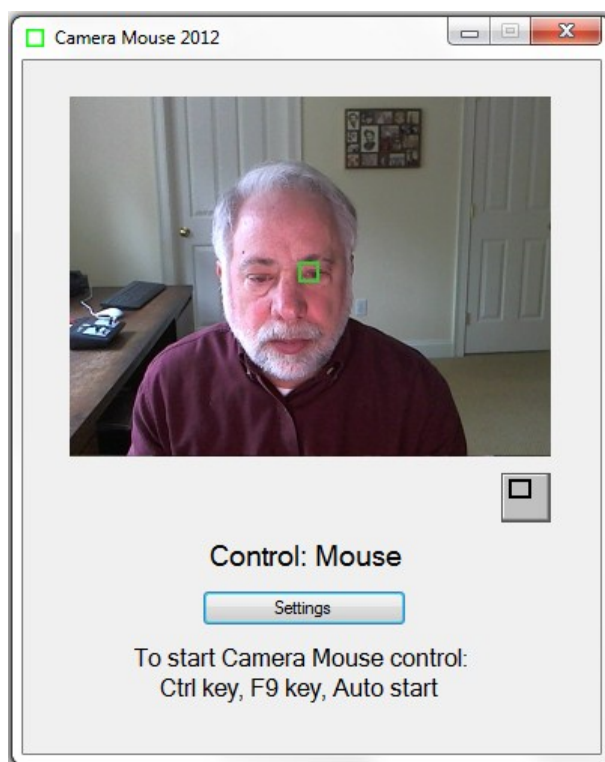
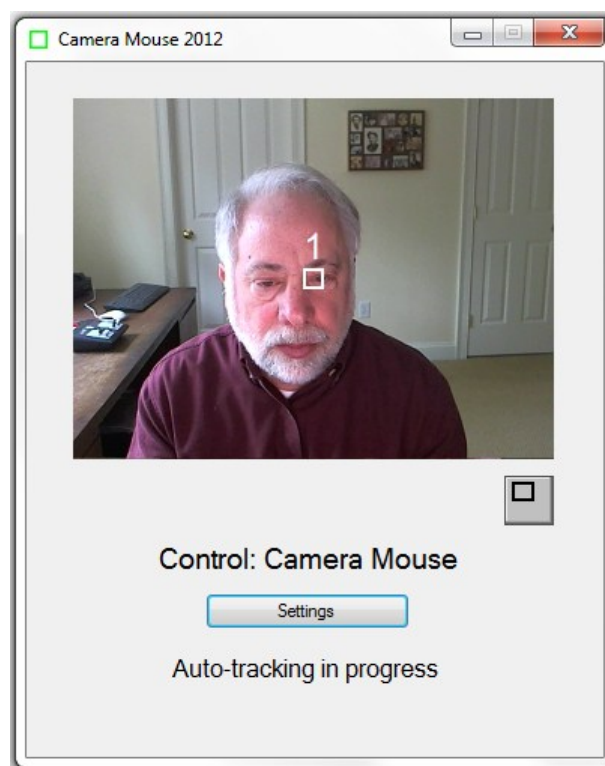
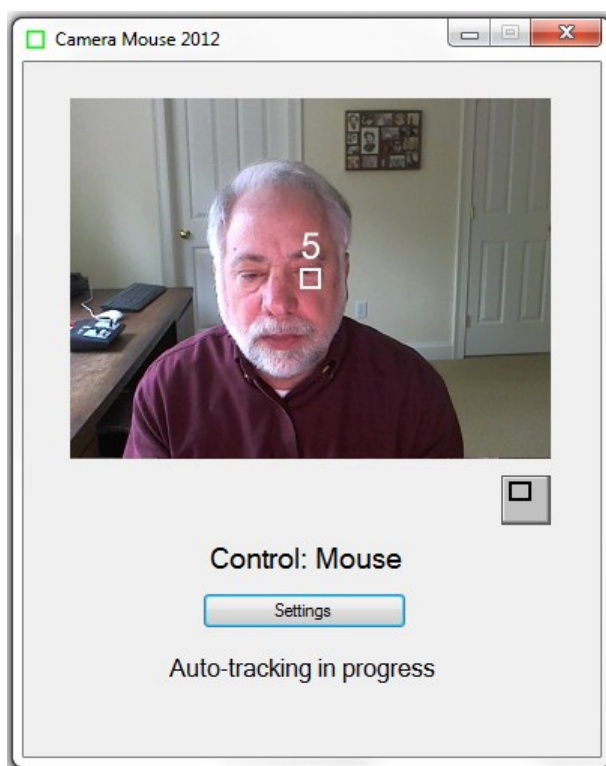
The traditional way is for the user to click on the point on the face to track. In the figures above we have used the corner of the eye. Some people use the ridge on the face between the nose and mouth (difficult with a beard). Some people use the tip of the nose. You can even put a small

bandage on your forehead or mark an X. If you wear glasses a good spot to track is some unique shape on the structural elements.



The second alternative is to have Camera Mouse run the 5-4-3-2-1 routine whenever the program is started.

What is the 5-4-3-2-1 routine? It is a way of setting the point on the face that is being tracked. When the 5-4-3-2-1 routine starts a white square (not a green square) appears at the very center of the screen and a white 5 appears on top of it. Camera Mouse then counts down from 5 to 4 to 3 to 2 to 1. The idea is to move your face so the feature you want to track is under the white square when the countdown ends.



The third alternative is to have Camera Mouse 2012 automatically try to find the corner of the eye to track on start up.

On the start-up of the program, acquire feature to track by

- ☐ User clicks on a feature on the face (default)
- ☐ Program automatically runs 5-4-3-2-1 routine
- ☒ Program automatically tries to locate corner of eye

RUN CAMERA MOUSE AUTOMATICALLY WHEN COMPUTER STARTS

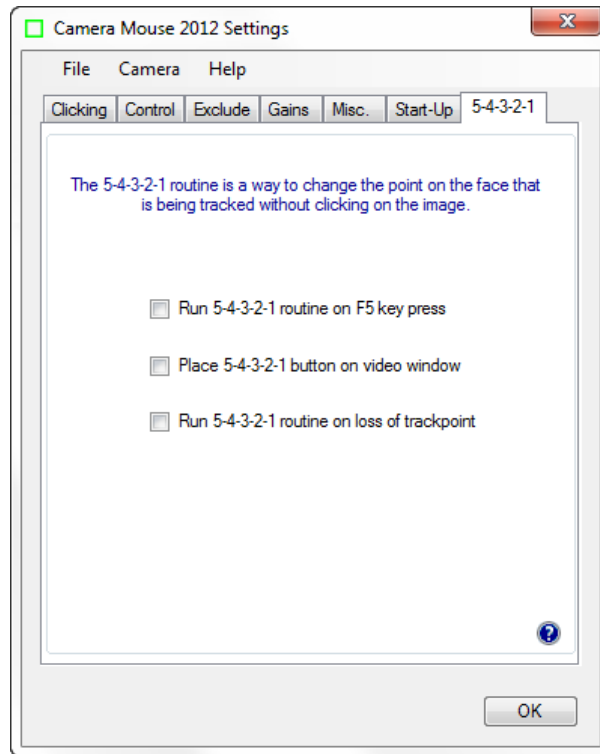
On the start-up of the computer, automatically run
Camera Mouse

- ☒ No (default)
- ☐ Yes

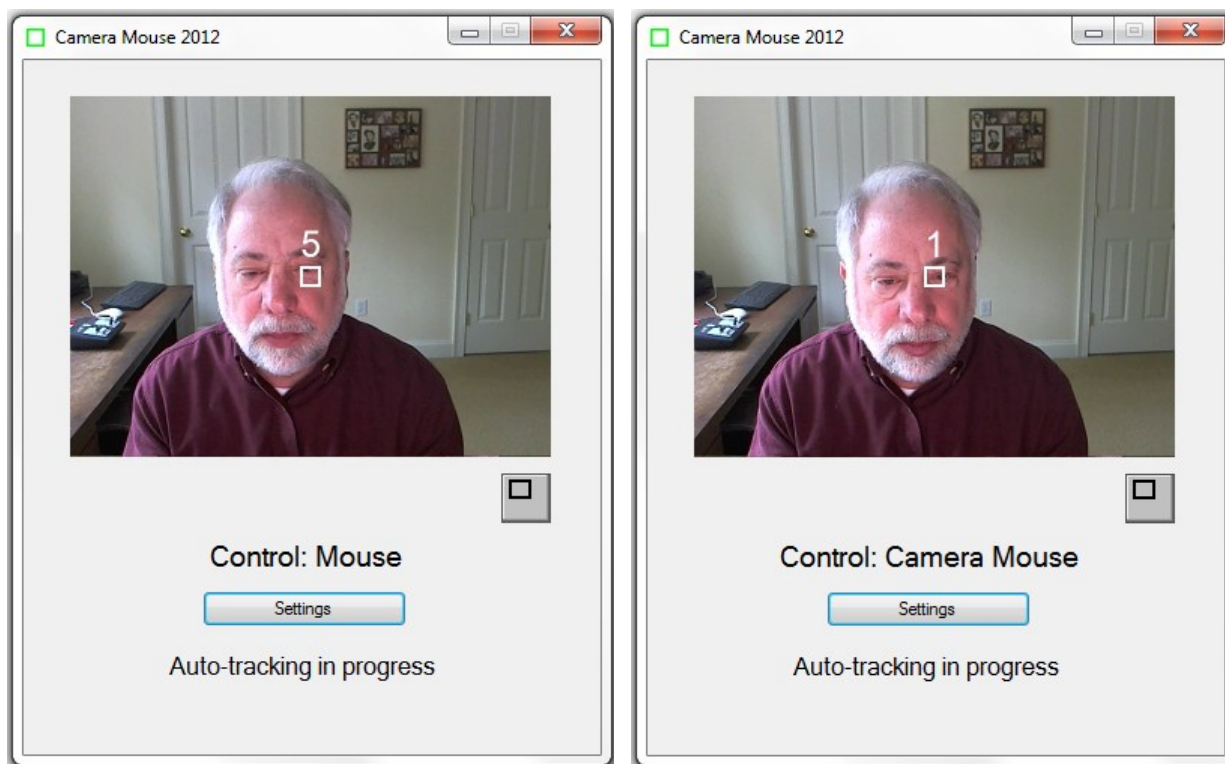
People who use Camera Mouse all the time can select “Yes” here and have Camera Mouse run automatically whenever the computer is started.

5-4-3-2-1 tab

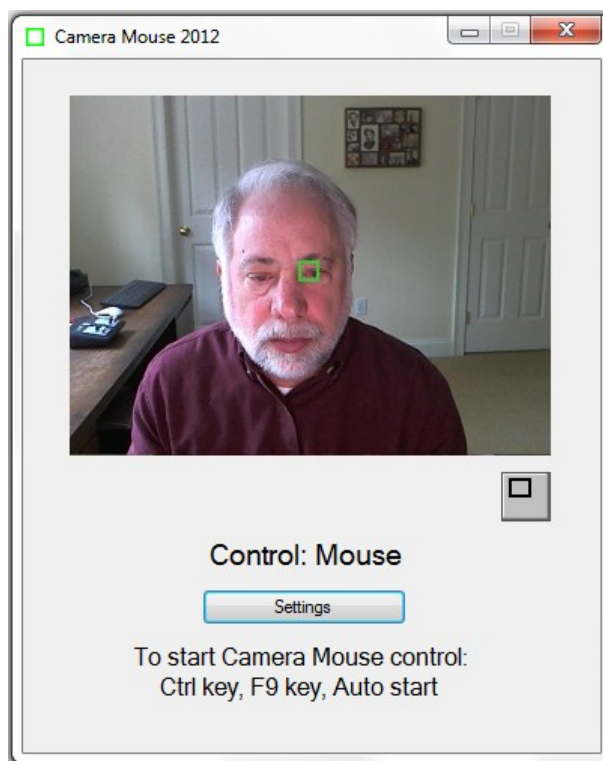
In addition to running the 5-4-3-2-1 routine on the start-up of Camera Mouse 2012, there are three other ways the 5-4-3-2-1 can be initiated depending on which boxes are checked in the 5-4-3-2-1 tab of Settings.



Again, the 5-4-3-2-1 routine puts a white square in the middle of the screen. The idea is for you to move so that the point you want to track is in the middle of the white square when the computer counts down from 5 to 4 to 3 to 2 to 1. Whatever is in the middle of the white square at 1 will be tracked by the green square



Whatever feature on the face is in the middle of the white square at 1 will be tracked by the green square



If you click on the box “Run 5-4-3-2-1 routine on F5 key press”

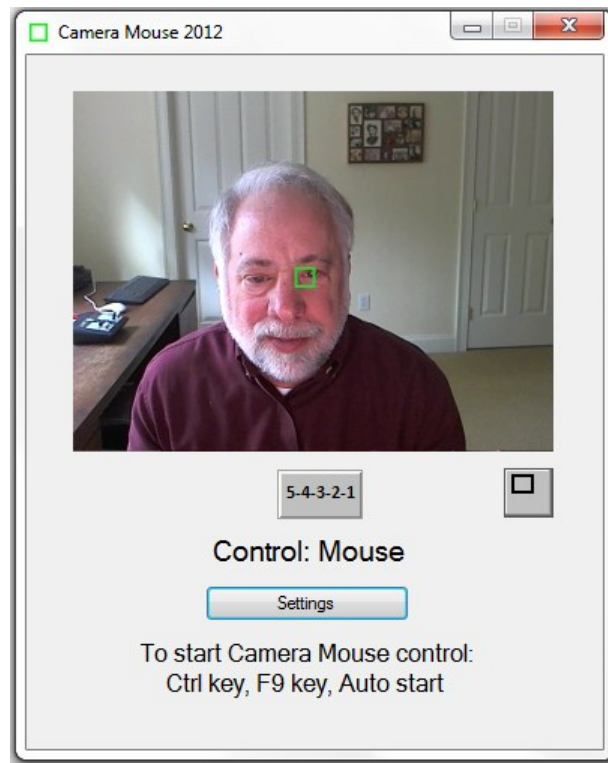
☒ Run 5-4-3-2-1 routine on F5 key press

then you will be able to run the 5-4-3-2-1 routine whenever you press the function key F5 on the keyboard.

If you click on “Place 5-4-3-2-1 button on video window”

☒ Place 5-4-3-2-1 button on video window

then a new button appears on the Camera Mouse window. Clicking on the button (either with the mouse or with Camera Mouse) triggers the 5-4-3-2-1 routine.



If this option is selected, the 5-4-3-2-1 button also appears on the smaller window.



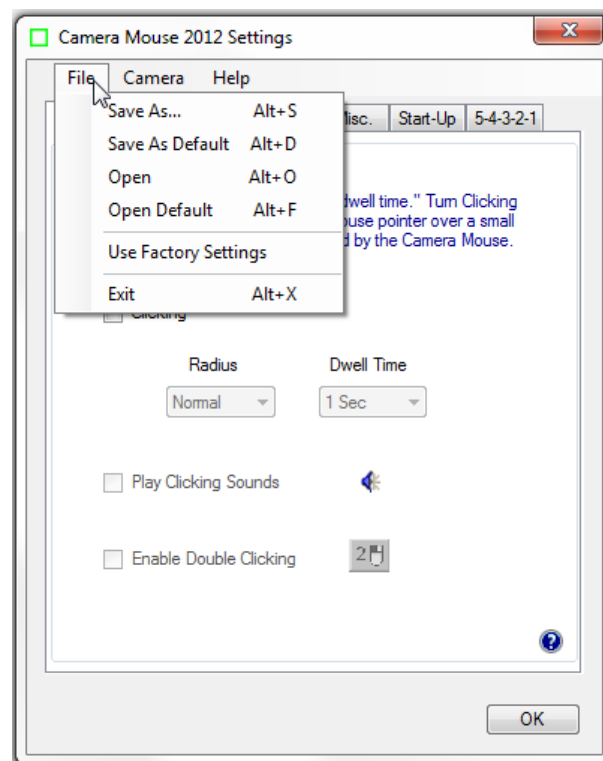
If you click on the option “Run 5-4-3-2-1 routine on loss of trackpoint”

☒ Place 5-4-3-2-1 button on video window

then if the head moves off the screen and Camera Mouse loses tracking the 5-4-3-2-1 routine will be run automatically.

Now let’s take a look at the menu items.

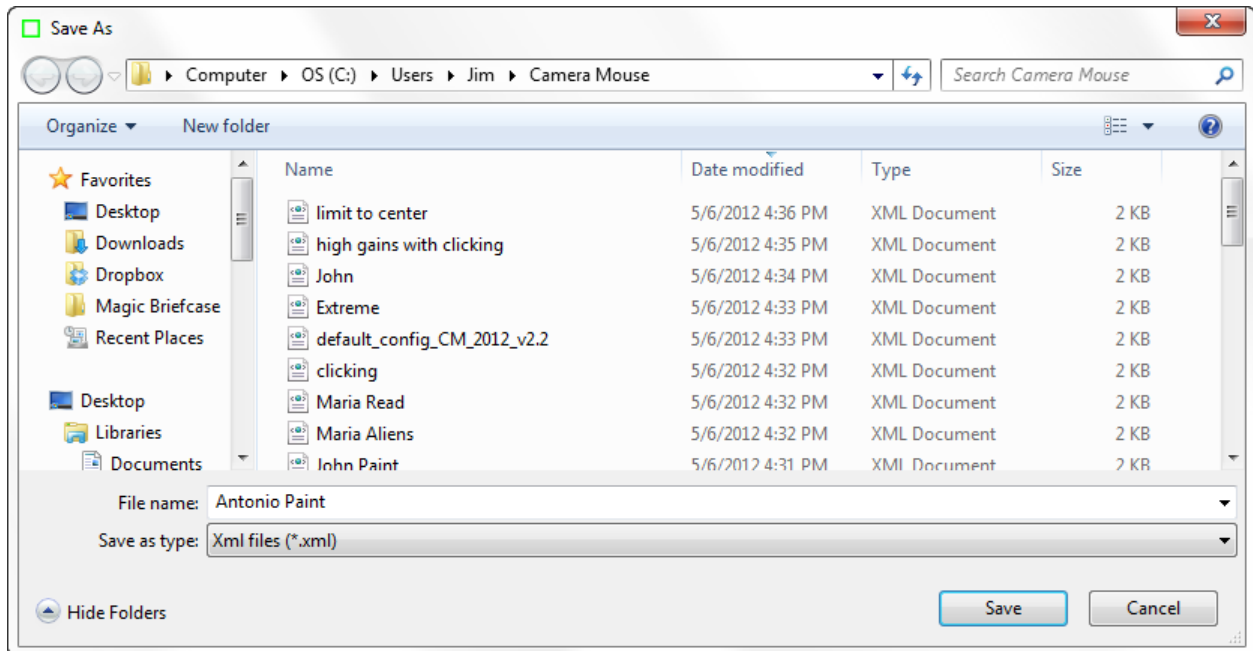
File menu



Different Camera Mouse Settings might be used with different software or by different people. With Camera Mouse 2012 you can Save the settings through the File pull-down menu.

SAVE AS ...

The Save As... menu option allows you to give the current settings a name and then save them on the disk for future use. *ALL of the settings under all the tabs are saved in one file.* For example to save Antonio's settings for use with the Paint program:

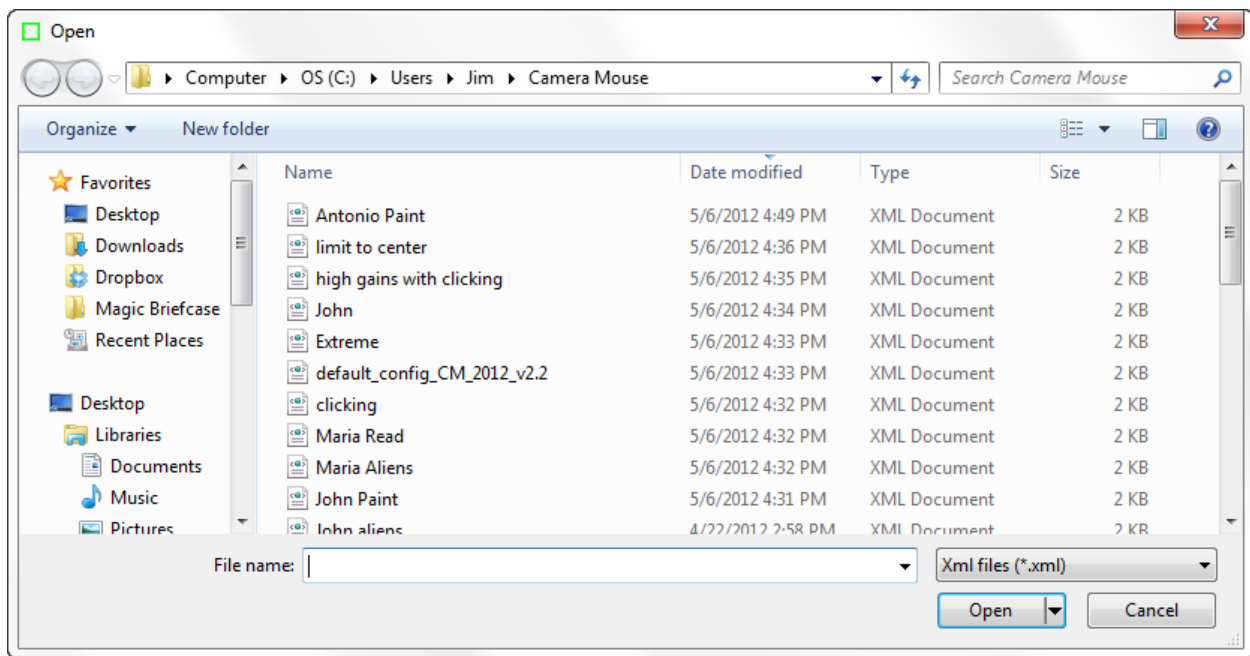


SAVE AS DEFAULT

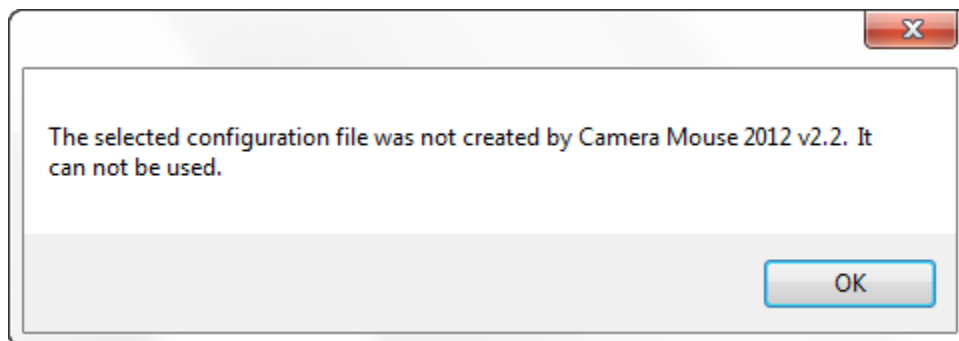
Save As Default allows you to save the current settings as the default settings. These are the Camera Mouse Settings that the program uses automatically when it is started up.

OPEN

Open allows you to Open a previously saved Camera Mouse Settings file.

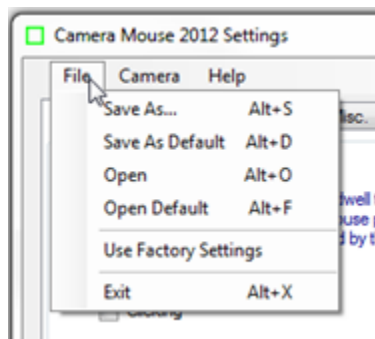


If the file you select was not saved by the current Camera Mouse 2012 version the program will not be able to open the file and you will receive a message to that effect.



OPEN DEFAULT

Open Default allows you to open the current default file. The current default settings become the new settings for Camera Mouse.



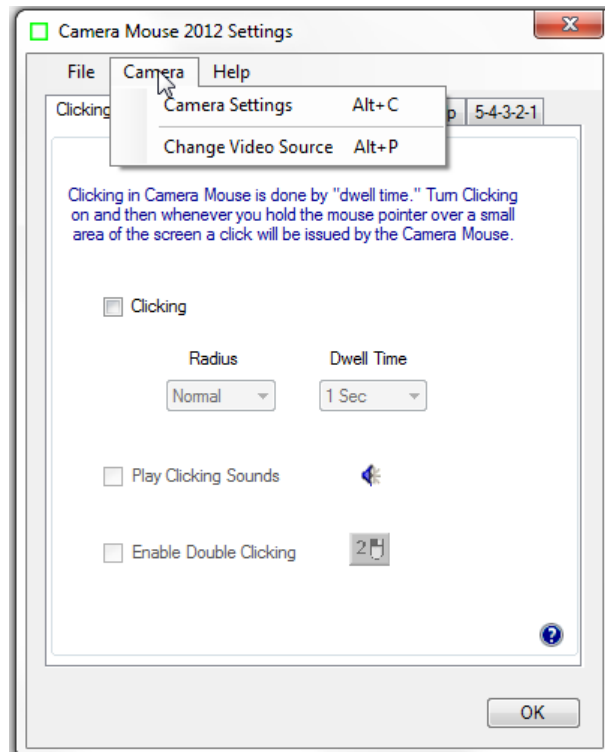
USE FACTORY SETTINGS

If you want to return to the original settings that came with the program from the “Factory” select Use Factory Settings in the File pull-down menu. This changes the Settings in the window. They can then be saved on the disk as the default through the File menu.

EXIT

Selecting Exit in the File menu causes the Settings Window to close. Selecting Exit is the same as clicking on the OK button at the bottom of the Camera Mouse Settings window.

Camera menu



CAMERA SETTINGS

Camera Settings takes you to the control window for the USB camera you are using. Camera Settings are provided by the manufacturer of the webcam you are using. For example, with my Logitech HD Pro Webcam C910 camera here's the window I see when I first click on Camera Settings:



The most useful control here is the **digital zoom** control for the webcam.



By adjusting the zoom you can adjust the size of the face in the video window. In the examples above the zoom control is one notch up so the face appears to be larger in the video window than with the default webcam setting.

If the facial feature with the Camera Mouse track point often moves off the edge of the screen then it would be good to zoom out the camera some more if you can. The Gain settings and the zoom counteract each other in the sense that if you are way zoomed out then you might need higher Horizontal and Vertical Gain settings.

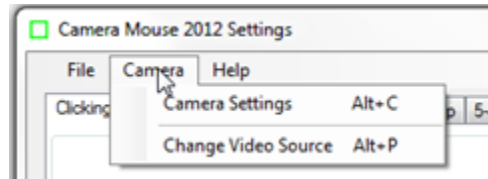
Note that you usually want “Follow my face” unclicked or off (or “Automatic Face Tracking Off”) in the Camera Settings because Camera Mouse is doing face tracking and if your camera is also then the two can counteract each other in strange ways. The only exception we have found is if the person using Camera Mouse has large spastic movements of the head. Then putting on automatic Face Tracking in the camera might prove useful.

Usually you want Auto-focus turned on, as above.

Clicking on the Advanced Settings tab shows the following window:



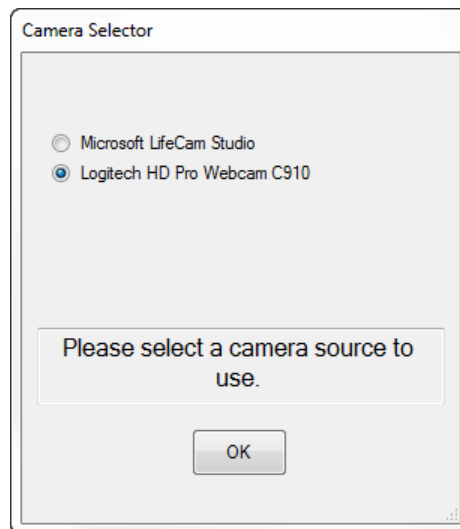
Using “RightLight” usually is good because this causes the camera driver to automatically adjust the brightness and coloring for best viewing and also for best tracking.



CHANGE VIDEO SOURCE

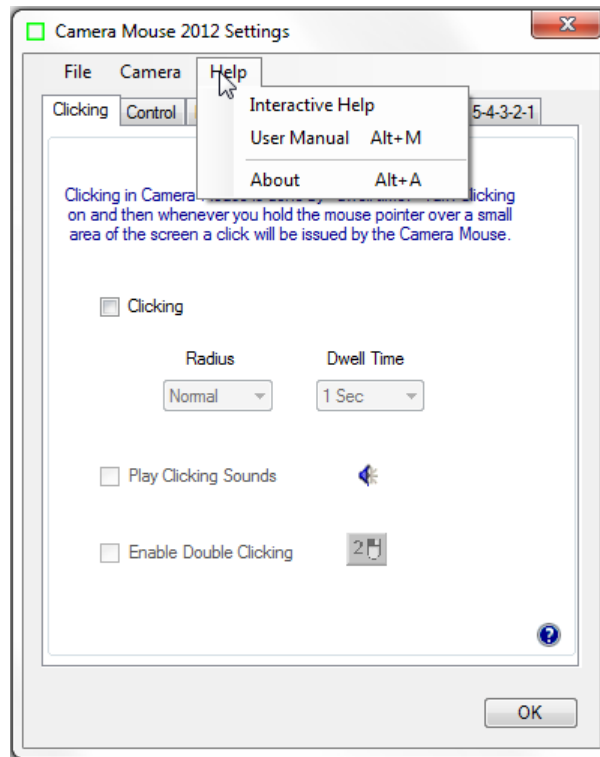
If there is just one camera or source of video connected to the computer then the Change Video Source menu item will be gray and not able to be selected.

If two or more cameras are connected to the computer then you can choose this menu item to change the cameras for Camera Mouse if you would like



This menu item also is useful if you have a television tuner or other non-related video source connected to your computer.

Help menu



The Help menu can be used to call up the Interactive Help facility as well as this manual.

The About selection displays the About box:



At the bottom of the About box is the version number of the software you are using.

WHO IS RESPONSIBLE FOR CAMERA MOUSE 2012?

Camera Mouse was invented by Prof. James Gips (Boston College) and Prof. Margrit Betke (then at Boston College, now at Boston University) in 1999-2000. The initial version was developed by Peter Fleming and then Chris Fagiani, who were undergraduates at Boston College. The initial version made use of a \$1,000 Sony pan-tilt-zoom video camera and a special purpose video capture board. The first prototype using a USB webcam was developed by Jon Gips.

The Camera Mouse technology was licensed by Boston College to Camera Mouse, Inc., a start-up company based in Texas, in 2004. They developed and sold a webcam-based commercial version of the program, but couldn't make a financial success of it.

In 2007 Wajeeha Akram, a graduate student at Boston University working with Prof. Betke, developed a research version of Camera Mouse.

Camera Mouse 2007 was engineered and implemented under contract with Boston College by Donald Green, of Mekinesis, with the functional specifications of the program developed by Jim Gips. Don and Jim and Matt McGowan continued to expand and improve the program in releases of Camera Mouse 2008, 2009, 2010, and 2011. Camera Mouse 2012 is a major rewrite. The functional specifications, user interface, and overall project are the responsibility of Jim Gips. Don Green heads the software engineering working with Christine Hsu Nason, his colleague at OpCode Consulting, and with Matt McGowan. The new automatic feature detection routine for locating the eye on start-up is based on work by Yinghao Cai when she was a Visiting Scholar at Boston College.

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QUESTIONS OR SUGGESTIONS?

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Please see the website at www.cameramouse.org for more information about Camera Mouse 2012 and for information about programs that can be used about Camera Mouse 2012 and for answers to FAQs (Frequently Asked Questions) that may not be answered in this manual.

Thank you for using Camera Mouse 2012!